(c) <u>REMARKS</u>

The claims are 17, 19, 20 and 22 with claim 17 the sole independent claim. Claims 18 and 21 were cancelled and subject matter therefrom added to claim 17. New claim 22 has been added. Reconsideration of the claims is requested.

Support for step (f) in clam 17 for the ejection of the aerosol at 50 m/s is found in US 2004/007249 A1 at paragraphs [0038] and [0044]. Support for claim 22 regarding heating the substrate is found in US 2004/0077249 A1 at paragraphs [0032], [0038] and [0044].

Claims 17-21 were rejected as obvious over Bethune '054 in view of Nakahara '883. The Examiner admits the cited references fail to teach ejecting an aerosol from a nozzle at 10/ms or faster. Nakahara further teaches generating ultra-fine particles of a metal, inorganic substance, organic substance and the like in paragraph [0002]. In paragraphs [0031] and [0038] of Nakahara, zirconium metal was evaporated and deposited as a film. No carbon fibers are illustrated in Nakahara. The rejection is respectfully traversed.

Prior to addressing the grounds of rejection, applicants wish to briefly review certain key features and advantages of the present claimed invention. The key claimed step of "ejecting aerosol from a nozzle at 50[m/s] or faster" provides the following beneficial performance results:

Gas and carbon fibers that are generated in a first chamber are caused to flow in a transporting tube. The flow of the gas and the entrained carbon fibers enables the

longitudinal direction of the carbon fibers to be in a direction in which the carbon fibers smoothly flow. The carbon fibers are ejected toward a substrate such that the carbon fibers are oriented substantially perpendicular to the surface of the substrate. The ends of the carbon fibers impact the substrate and enhance the adhesion forces between the carbon fibers and the substrate.

Therefore, the present claimed invention provides an apparatus for making a substrate on which carbon fibers are perpendicularly oriented and fixed with high adhesion. For this purpose, the carbon fibers are ejected from the nozzle at a velocity of at least 50 m/s.

In contrast, neither Bethune or Nakahara discloses or suggests a pressure control means for "ejecting aerosol from a nozzle at 50 [m/s] or faster." Nakahara merely discloses ejecting ultrafine particles from a nozzle at a "high speed." Nakahara provides no reason to eject carbon fibers at a speed of at least at 50m/s.

When a metal, such as the zirconium of Nakahara, is turned into ultrafine particles, its melting point is reduced. According to Table 1 in <u>Reference Document 1</u>, Honma, et al., when Fe (melting point 1535° C) and Co (melting point 1495° C) in bulk are turned into particles having a diameter of about 30nm, their melting points in argon gas are reduced to 900° C and 650° C, respectively. Also, according to Table 1.2 in <u>Reference Document 2</u>, Akio, et al., when Au (melting point 1300°K), In (melting point 430°K), Ni (sintering temperature 700° C), and W (sintering temperature 2000° C) in bulk are turned into nanosize particles, their melting point and sintering temperatures lower to 900°K,

370°K, 200° C and 1100° C, respectively. Furthermore, it is well known that the melting point of not only the above-mentioned metals, but also of many other metals in bulk, is reduced when the metals are turned into particles.

It is understood from the above facts that collision of ultrafine metal particles with a substrate changes their kinetic energy, lost by the collision, into heat, and then the resulting heat melts the metal and fixes it on the substrate.

On the other hand, as <u>Reference Document 3</u>, Wang, shows it is known that a carbon nanotube is thermally stable up to 2800° C. Therefore, it is understood that the possibility for the carbon fibers to <u>melt</u> and thereby become fixed on a substrate, is low. Further, it is understood that kinetic energy distorts a substrate physically and/or thermally when high speed carbon fibers collide with the substrate. This impact distorts the substrate and works to fix the carbon fibers on the substrate. As described above, the inventors understand from their actual experience that sufficient energy is imparted to the carbon fibers to fix them stably, when the carbon fibers are ejected from a nozzle at a velocity of 50m/s or faster. At this velocity the carbon fibers do not melt when striking the substrate. Instead, the impact physically forces them into the surface of the surface from which a structure is built-up.

Accordingly, the pathway by which the metal particles of Nakahara are fixed on a substrate differs in kind from the way in which carbon fibers of the present invention are fixed on a substrate. Therefore, although Nakahara discloses forming a film of high quality by ejecting ultrafine particles at a "high" speed, such ejection speed is only

needed to cause the particles to soften or melt on impact and adhere to the substrate. This is different from the speed for ejecting carbon fibers which causes the substrate to be distorted and the particles to adhere to its surface layer. Nakahara fails to disclose and suggest pressure control means for "ejecting aerosol from a nozzle at 50m/s or faster" which is a claimed and necessary feature of the present invention.

Taken another way, Nakahara ejects his metal particles at a speed sufficient to melt and fix the particles when they strike the substrate. To the contrary, applicants eject their carbon fibers at a very high speed sufficient to distort the substrate and to form a carbon fiber film or a lump containing carbon fiber. The carbon nanotubes are not melted and fixed, but retain their nanotube configuration. Furthermore, because neither Bethune nor Nakahara discloses or suggests providing a longitudinal direction for transporting carbon fibers in a transporting tube or ejecting aerosol from a nozzle at 50 [m/s] or faster, a person skilled in the art would not be able to "optimize" the references to achieve the present invention.

For the record, reference Document 1 is: Yoshikazu Homma, Yoshihiro Kobayashi, Fumihiko Maeda, EFFECT OF CATALYSTS ON CARBON NANOTUBE GROWTH ON SILICON SUBSTRATES IN CHEMICAL VAPOR DEPOSITION, Surface Science Vol. 25, No. 6, pp. 339-344, 2004

Reference Document 2 is: "MODERN APPLIED CHEMISTRY SERIES 4 ULTRAFINE PARTICLES-CHEMISTRY AND FUNCTION", Kato Akio, Arai Hiromichi, (Asakura Shoten).

Reference Document 3 is: Tong Wang, LIGHT SCATTERING STUDY ON SINGLE WALL CARBON NANOTUBE (SWNT) DISPERSIONS, Georgia Institute of Technology, April, 2004. A formal Information Disclosure Statement will be filed very shortly citing and providing full copies *inter alia*, of reference documents 1-3. An English Language translation of Nakahara will also be included to complete the record.

Accordingly, Applicants submit that none of the applied references, whether considered alone or in combination, discloses or suggests the present claimed invention nor renders it unpatentable. Accordingly, it is respectfully requested that the claims be allowed and that the case be passed to issue.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

/Peter Saxon/
Peter Saxon
Attorney for Applicants
Registration No. 24,947

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

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